Periscope.

CRANIO-CEREBRAL TOPOGRAPHY.

By C. L. DANA, M.D.

The writer has frequently received requests for copies of the accompanying rules, originally published in the *Medical Record*, January 12, 1889, and ventures, therefore, to reproduce them here. They have been carefully revised, and condensed to some extent.

I have also added directions regarding the method of tapping the ventricles and of reaching the internal capsule.

A very good cyrtometer has been made for me by Meyrowitz Brothers, Fourth Avenue and Twenty-third Street.

RULES OF CRANIO-CEREBRAL TOPOGRAPHY.

Rule I. The longitudinal fissure.—This corresponds with the naso-occipital arc.

Rule II. The fissure of Rolando.—(*a*) *The upper end.* Use the cyrtometer as directed ; or, measure the distance from the glabella to the inion ; find 55.7 per cent. of this distance, and the figures obtained will indicate the distance of the upper end of the fissure of Rolando from the glabella. As the naso-occipital arc ranges from 28 to 38 ctm. (11 to 15 inches), the point sought for lies from 15.7 to 26.8 ctm. (6⅛ to 10½ inches) from the glabella.

(*b*) *The course of the fissure.* Starting from the upper end of the fissure, lay off with the cyrtometer a line forming an angle of sixty-seven degrees anteriorly with the longitudinal fissure. This gives the direction of the upper two-thirds of the fissure, or for about 5.6 ctm. (2¼ inches), The lower third, about 2.1 ctm., is slightly more vertical. The bend of the fissure is about on a level with the anterior end of the parietal fissure. The total length of the fissure averages 8.5 ctm. (3⅜ inches).

(*c*) *To find the lower end* more exactly, if needed : Lay off a line from the stephanion to the asterion, and another from the bregma to the external auditory meatus. The

point of intersection will be just over the lower end of the fissure. It should be about 1 ctm. above the fissure of Sylvius. The asterion is usually easily felt just behind the upper part of the mastoid process.

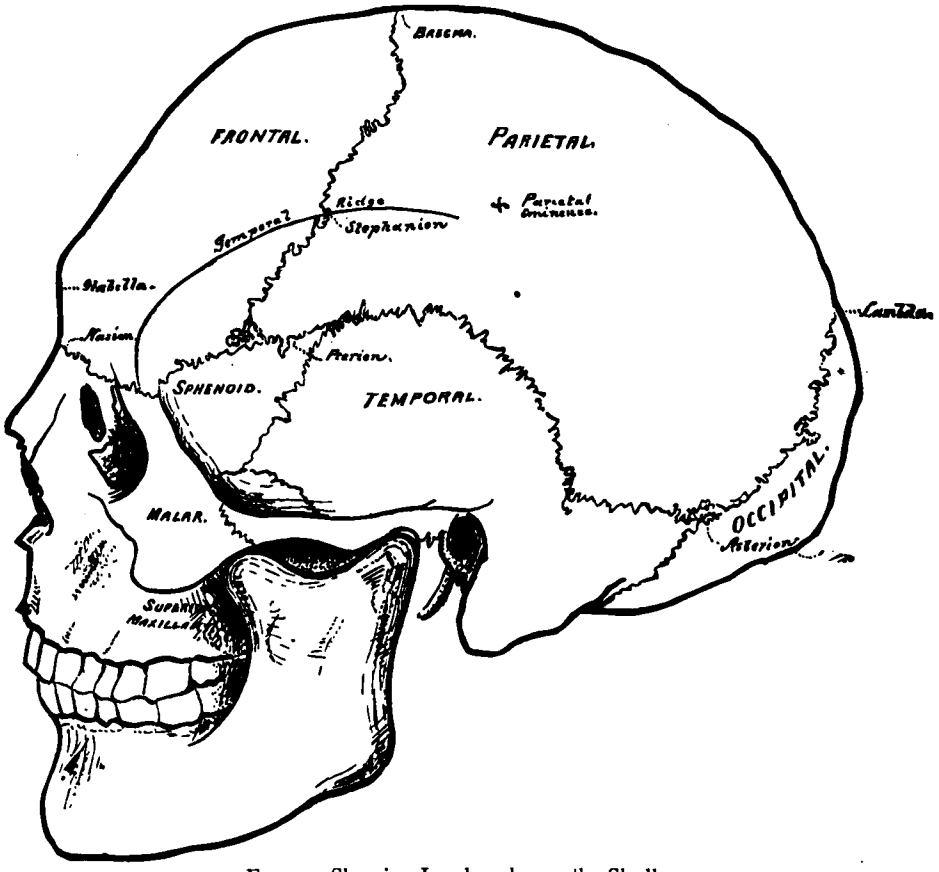

FIG. 1.—Showing Landmarks on the Skull.

Control Measurements and variations.—The upper end of the fissure is about 48 mm. (1⅞ inches) behind the bregma. The distance is 45 mm. in women and from 30 to 42 mm. in infants and young children respectively.

The lower end of the fissure is from 25 to 30 mm. (1 to 1⅜ inch) behind the coronal suture. The fissure does

not extend down so low in children, and is a little more vertical.

Rule III. To find the fissure of Sylvius.—Draw a vertical line from the stephanion to the middle of the zygoma. Draw a horizontal line from the external angular process to the highest part of the squamous suture; continue this back, gradually curving it up till it reaches the parietal eminence. The junction of the two lines will be at the beginning of the fissure of Sylvius. The vertical line indicates nearly the position of the anterior or vertical branch of the fissure, which is, however, directed a little more forward, and is about 2.5 ctm. (1 inch) in length. The posterior part of the line indicates the position of the posterior branch of the fissure. The triangular gyrus and motor speech-centre lies just anterior to the vertical branch of the fissure. The operculum lies just back of it. The tip of the temporal lobe reaches nearly as far forward as the posterior edge of the orbital process of the malar bone. The fissure of Sylvius is separated from the lower end of the precentral sulcus by a convolution 1 ctm. wide on the average (Horsley).

Control Measurements and Variations.—Reid's method of finding the fissure of Sylvius is to "draw a line from a point 1¼ inch behind the external angular process to a point ¾ inch below the parietal eminence. The ascending branch starts from a point ¾ inch back from the anterior end of this line, and 2 inches (5 ctm.) back of the external angular process."

Dr. Hare draws a line from the external orbital process to the inion. A point 1⅛ inch behind the anterior end of this line marks the beginning of the fissure, and a straight line from here to the parietal eminence marks the course of the posterior or main branch.

The fissure of Sylvius runs nearly horizontally, and lies either under or a little above the uppermost part of the parieto-squamous suture. *This suture*, the *external orbital process*, and the *parietal eminence* are the guiding landmarks by help of which the surgeon can often operate without marking down lines on the scalp.

In children the fissure is sometimes higher and more oblique.

Rule IV. To find the parieto-occipital fissure.—Find the lambda, mark a point 3 mm. anterior to it, draw a line through this at right angles to the longitudinal fissure, extending about 2.25 ctm. (1 inch) on each side of the median line. This marks the net of the parieto-occipital fissure. If the lambda cannot be felt, its position may be found by measuring the naso-occipital arc, and taking 22.8 per cent of it. This indicates the distance of the lambda from the inion or external occipital protuberance. The average distance in male adults is 7.42 ctm. ($2\frac{7}{8}$ inches). It is greater in women, by a little over a millimetre, than in men.

Control Measurements and Variations.—The position of the fissure ranges from just under the lambda to as much as 12 mm. ($\frac{1}{2}$ inch) in front of it.

It is rather further in front, proportionately, in young children, and, according to Féré, in women.

Rule V. To find the interparietal sulcus.—First mark out the lines for the fissure of Rolando, fissure of Sylvius, and parieto-occipital fissure, and mark the position of the parietal eminence. Find a point on a level with the bend of the fissure of Rolando, and about 2 ctm. ($\frac{3}{4}$ inch) behind it. From this draw a curved line up and back, keeping it half-way between the fissure of Rolando and parietal eminence as it ascends, and half-way between the parietal eminence and longitudinal fissure as it passes back. Continue the line back till it reaches a point just outside the external end of the parieto-occipital fissure. This fissure divides the parietal lobe into a superior and inferior lobule. The parietal eminence lies over or a little behind the supramarginal gyrus, and about over the middle of the inferior parietal lobule.

Control Measurements.—This fissure has a most variable arrangement, and no absolute rule can be laid down.

Its anterior inferior end is about an inch from the angle formed by the prolongation of the fissures of Rolando and Sylvius.

Rule VI. To find the inferior precentral or vertical sulcus, and the inferior frontal and superior frontal sulci.—The

inferior precentral or vertical sulcus passes nearly vertically just posterior to the coronal suture. Its lower end is 1 ctm. above the Sylvian fissure (Horsley), and 2 mm. behind the coronal suture. Its upper end reaches to the level of the mid-point of the fissure of Rolando, and is 4 mm. behind the coronal suture. It lies 2 to 2.5 ctm. anterior to the fissure of Rolando.

The inferior, or second, frontal sulcus passes forward from the precentral sulcus at a point a little above the stephanion. It continues forward in a line nearly identical with the frontal part of the temporal ridge (Reid).

The superior, or first, frontal sulcus begins at a point half-way between the fissure of Rolando and a line prolonged up from the inferior precentral sulcus (Horsley).

This point should be from 2 to 2.5 ctm. in front of the fissure of Rolando. The fissure passes forward parallel to the longitudinal fissure, and its line, if prolonged, ends in the supra-orbital notch (Reid).

Rule VII. To outline the frontal lobes.—The anterior end of the frontal lobes reaches to a point determined by the thickness of the frontal bone. This ranges from 2 to 8 or more mm. $\frac{1}{12}$ to ($\frac{1}{3}$ in.).

The floor of the anterior fossa reaches in front to a level a little above the supra-orbital margin (16 mm., $\frac{3}{4}$ in., Heftler). It slopes down and backward, its posterior limit being indicated by the lower end of the coronal suture.

Rule VIII. To find the temporal lobe and the first and second temporal sulci.—The temporal lobe is limited above by the fissure of Sylvius, below by the contour line of the lower border of the cerebrum. This corresponds to a line drawn from a point slightly (about 12 mm.) above the zygoma and the external auditory meatus to the asterion, and continued on along the superior occipital curve to the inion. The anterior border of the lobe corresponds to the posterior border of the orbital process of the malar bone. The posterior border of the temporal lobe is somewhat arbitrarily found by drawing a line from the Sylvian fissure line at a point 2.5 ctm. below the parietal eminence, backward and downward to the anterior occipital fissure.

The temporal lobe is about 4 ctm. (1⅝ inch wide) at the external auditory meatus. A trephine, as Bergmann states, placed half an inch above the meatus would enter the lower part of the lobe. The middle of the lobe is in a vertical line from the posterior border of the mastoid process. A line from the upper end of the fissure of Rolando to the point of the process would pass through this important sensory area.

A point just over the posterior part of the first temporal gyrus is found (Barker) by drawing a line 1½ inch long horizontally back from the external meatus, and then erecting a vertical 1½ inch. At this point the skull is sometimes trephined in mastoid disease.

The first temporal gyrus is about 1 inch (2.5 ctm.) wide; the second temporal is a little narrower (Reid).

Rule IX. To find the occipital lobe and anterior occipital fissure.—The upper anterior border lies under a line drawn from just above the lambda (1 to mm.), curving out and down to a point about at the junction of the anterior and middle third of the line from the inion to the asterion. The lower border corresponds pretty closely to the superior occipital curved line. The anterior occipital sulcus when present, should lie in the anterior border of the lobe.

Rule X. To find the position of the central ganglia, viz., corpus striatum and optic thalamus, draw a line from the upper end of the fissure of Rolando to the asterion, practically a vertical line. This limits the optic thalamus posteriorily. A vertical line parallel to the first, a little in front of the beginning of the fissure of Sylvius, limits the corpus striatum anteriorly. A horizontal plane 45 mm. (1¾ inch.) below the surface of the scalp at the bregma, limits the ganglia superiorly. The ganglia lie about 35 mm. (1⅜ inch) below the superior convex surface of the brain (Féré).

Rule XI. To reach the internal capsule (in its anterior part), and the common seat of cerebral hæmorrhage.—Dr. C. K. Mills suggests trephining over the temporal lobe posteriorly and low down, then passing the exploratory-needle forwards and inwards.

A better way, according to experiments made by myself, is to find the mid point between the extremities of the basal ganglia (*vide* Rule XI.). Then trephine, at a point about 3 ctm. (1¼ inch) from the median line, and plunge the needle directly down and slightly outward, for a distance of 4 to 6 ctm. (1½ to 2½ inches).

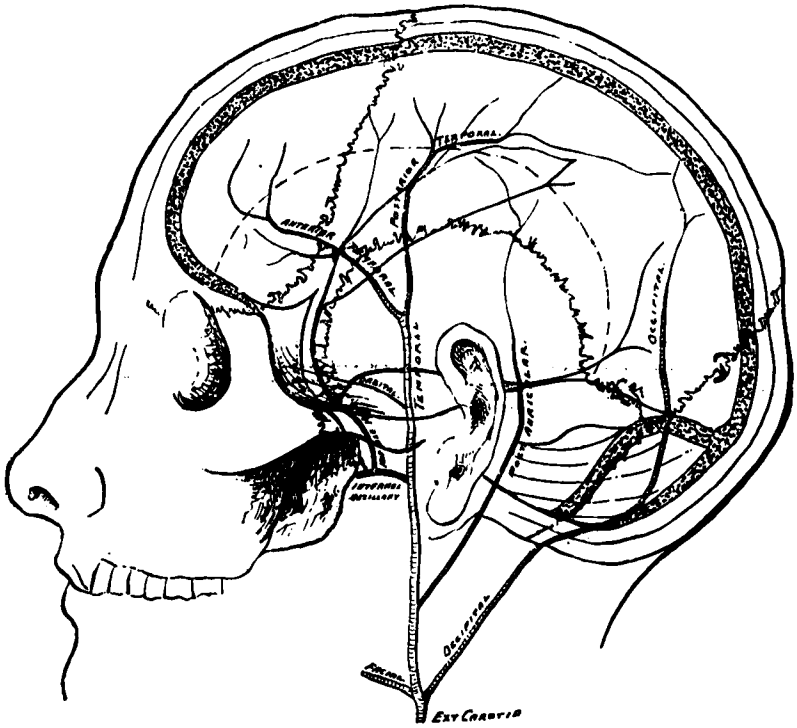

FIG. 2.—Showing the Course of the Arteries of the Scalp and Dura Mata.

Rule XII. To reach the lateral ventricles.—A number of routes may be taken. The lateral is recommended by Keen. Mark a point 1¼ inch behind the external auditory meatus, and 1¼ inch above a base line made by drawing a line through the lower border of the orbit and the external auditory meatus.

Trephine at this point and plunge the director into the brain in the direction of a point 2½ to 3 inches vertically above the opposite external meatus.

The ventricle lies at a depth of 2 to 2¼ inches (5 to 5.7 ctm.).

Rule XIII. To avoid the meningeal arteries and central sinuses.—The course of the middle meningeal artery has been described and is seen in Fig. 2. This artery is the only one of importance or very definite course. The superior longitudinal sinus generally (not always) lies a little to the left of the median line. The torcular Herophili lies approximately under the inion. The lateral sinus lies generally under the line from the inion to the asterion, and just grooves the postero-inferior angle of the parietal bone.

Rule XIV. To outline the base of the brain.—The rules for this are given in Rules VII., VIII., and IX., for finding the frontal, temporal, and occipital lobes.

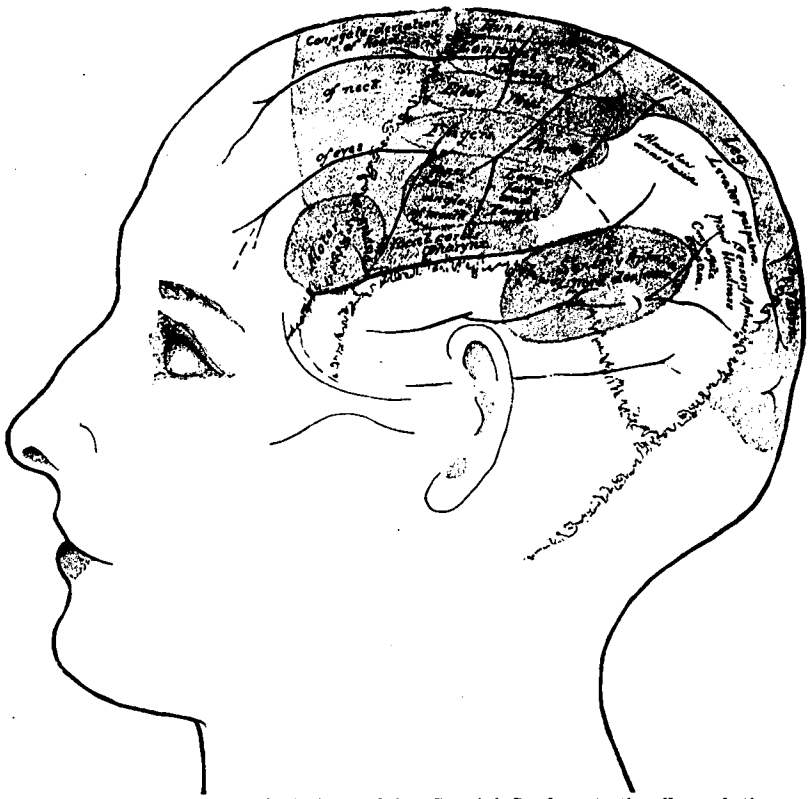

FIG. 3.—Showing the Relations of the Cranial Surface to the Convolutions and Cortical Centres.